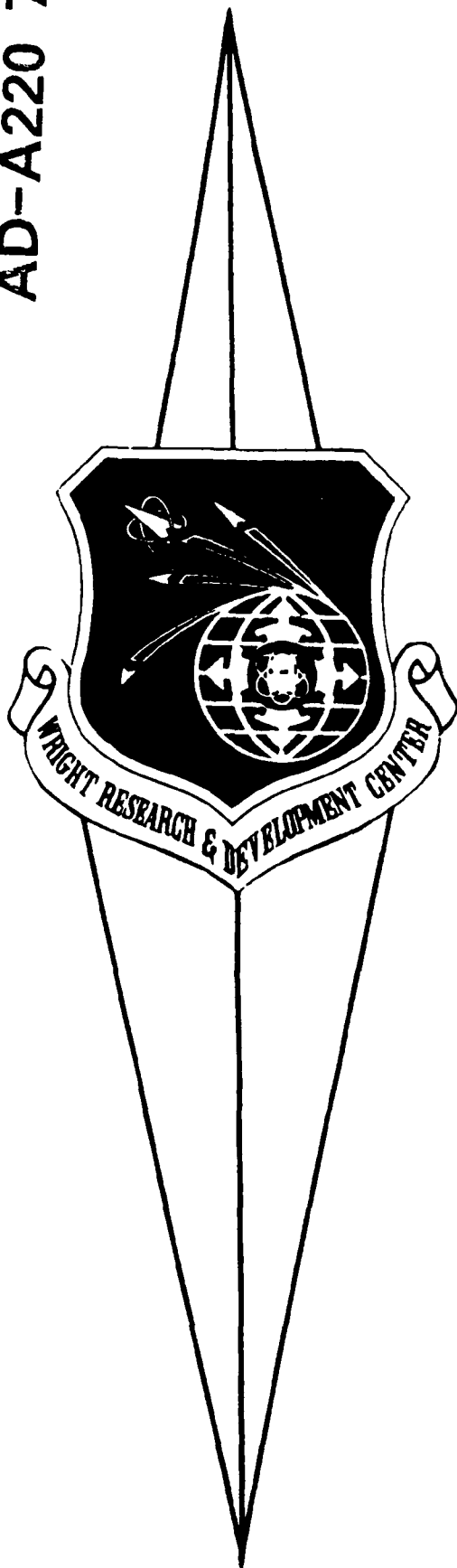


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WRDC-TM-90-301

FLIPPER User's Manual  
W. Z. STRANG

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AERODYNAMIC METHODS GROUP  
AERODYNAMICS & AIRFRAME BRANCH  
AEROMECHANICS DIVISION

JANUARY 1990

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FLIGHT DYNAMICS LABORATORY  
WRIGHT RESEARCH AND  
DEVELOPMENT CENTER  
WRIGHT-PATTERSON AFB, OH 45433

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FORWARD

This effort was accomplished under Work Unit 240410A1, entitled "Aerodynamic Design and Analysis Methods." The effort covers work performed during March 1989.

This work has been reviewed and is approved.

*William Z. Strang*

W. Z. Strang  
Aeronautical Engineer

*Dennis Sedlock*

Dennis Sedlock  
Chief, Aerodynamics & Airframe Branch



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## Introduction

Multi-block computational fluid dynamics (CFD) solvers require a tremendous amount of input data before a solution can be obtained. This data primarily exists in two files when using the WRDC/FIMM developed multi-block Euler solver, MERCURY, [1]. The first contains the numerical grid while the other holds the boundary conditions and block connection information (the connectivity file [1]).

One is often interested in the asymmetrical flow about a symmetrical configuration. Rather than manually constructing the grid and connectivity datasets for a full, symmetric configuration, it is much more efficient to let a computer program automatically generate such datasets from the symmetric portion.

FLIPPER is a computer program that reflects any MERCURY grid and boundary condition/connectivity information about the  $y$  equals zero plane.

## Running FLIPPER

FLIPPER is a Cray batch code that requires very little user interaction. The user only modifies the Cray JCL of FLIPPER.JOB to the appropriate grid and connectivity file names. When changing file names, change only the PDN, ID and ED parameters; leave the DN parameter unchanged. See Fig. 1. The full connectivity file is returned to the Tax front-end account with a name of CONNOUT.CPR and there may be renamed accordingly.

As mentioned previously, FLIPPER reflects the grid about the  $y$  equals zero physical plane. In so doing, an odd number of computational indices must be reversed to keep the computational coordinate systems of the reflected grid blocks right-hand. FLIPPER reverses the  $i$  index only. This index reversal is then accounted for in the reflected boundary conditions and block connections. Additionally, all symmetry conditions (boundary condition 5 [1]) are replaced with block connections. The reflected blocks are numbered in the following manner. Consider a 10 block grid as input to FLIPPER. The mirror image of block one will be block 11, the mirror image of block two will be block 12,

```

JOB, JN=FLIPPER, T=600, MFL, CL=PO.
ACCOUNT, AC=D840262, APW=SIRBAUGH.
*.
OPTION, STAT=OFF.
MODE, EMA=DISABLE.
*.
*. *****
*.  ACCESS THE HALF GRID
*. *****
*.
ACCESS, DN=GRIDIN, PDN=DELTA GRID, ID=FINAL.
*.
*. *****
*.  FETCH THE CONNECTIVITY FILE OF THE HALF GRID
*. *****
*.
FETCH, DN=COMET, TEXT=' [D850602.KEN] CONDELTA.DAT '.
*.
*. *****
*.  LEAVE THE FOLLOWING SEVEN COMMANDS ALONE
*. *****
*.
ASSIGN, DN=GRIDIN, A=FT10, LM=200000.
ASSIGN, DN=GRIDOUT, A=FT11, LM=200000.
ASSIGN, DN=CONNOUT, A=FT20.
*.
UPDATE, P=0, I=COMET:$IN.
CFT77, I=$CPL.
SEGLDR, GO.
*.
REWIND, DN=GRIDOUT:CONNOUT.
*.
*. *****
*.  THE FULL CONNECTIVITY FILE WILL BE NAMED
*.  CONNOUT.CPR ON YOUR VAX FRONT-END ACCOUNT.
*. *****
*.
DISPOSE, DN=CONNOUT.
*.
*. *****
*.  NAME THE FULL GRID TO BE SAVED ON THE CRAY
*. *****
*.
SAVE, DN=GRIDOUT, PDN=DELTA GRID, ID=FULL.
*.
*. *****
*.  MODIFY NOTHING MORE
*. *****
*.
AUDIT.
/EOF

```

Figure 1

and so on. Lastly, all memory allocation parameters used by MERCURY are updated to account for the additional grid blocks, block connections and boundary conditions.

#### References

1. Strang, W. Z., "MERCURY User's Manual," AFWAL-TM-88-217, November 1988.